

**SECONDARY BACTERIAL INFECTIONS
IN PULMONARY TUBERCULOSIS
A CLINICAL PROFILE**

**THESIS
FOR
DOCTOR OF MEDICINE
(GENERAL MEDICINE)**



**BUNDELKHAND UNIVERSITY
JHANSI (U. P.)**

C E R T I F I C A T E

This is to certify that the work entitled
"SECONDARY BACTERIAL INFECTIONS IN PULMONARY
TUBERCULOSIS - A CLINICAL PROFILE" has been carried
out by Dr. Satya Prakash Mishra himself. He has
also put in the necessary stay in the department of
Medicine as per university regulations.

Dated: . 1987

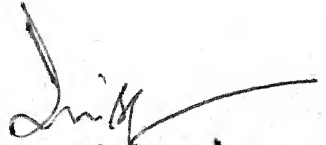


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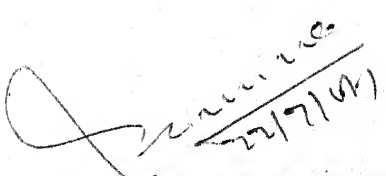
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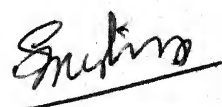
My sincere thanks are also due to my friends Dr. R.K. Garg, Dr. P.K. Gupta, Dr. Rajeev Mangal, Dr. K.K. Pande, Dr. D.K. Singh, Dr. Nirbhai Gupta and Dr. Sushil Roasia who have helped me tremendously at every level in the accomplishment of this work.

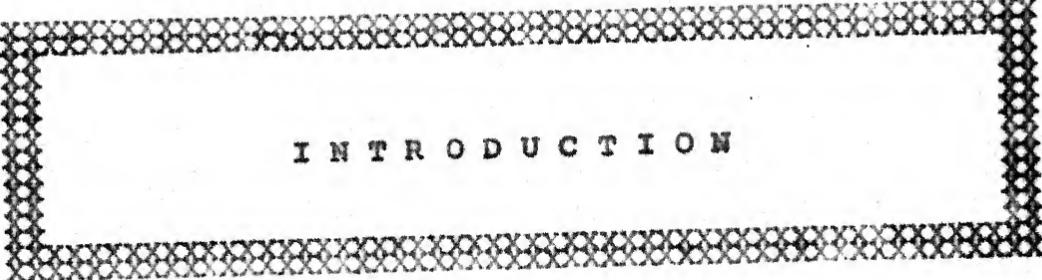
I gratefully acknowledge the help rendered by Mr. Vishan Lal, M.A., B.Lib., Librarian, and Mr. Jwala Singh & Mr. Ratnakar Pandey, Lab. Technicians, Department of Microbiology, M.L.B. Medical College, Jhansi.

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I dedicate this work to the memory of my father Late Shri M.L. Mishra and I pay my deep regards to my family members for their constant inspiration and help during the span of this study.

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(S. P. MISHRA)



I N T R O D U C T I O N

INTRODUCTION

Tuberculosis, one of the major public health problem in the developing countries of the world to day, has made its impact felt throughout the ages. No other disease has so much sociological, economic and health significance as tuberculosis (Koch and Morolda, 1962). The world health organisation estimates that there are 15-20 million infectious cases in the world at any one time with about 3 million deaths a year.

On the basis of decennial estimates of crude mortality for 1911 to 1921, the tuberculosis mortality for India was computed for the first time as 800 per 1,00,000. Lancaster reported that in most of Indian cities the mortality rates would be higher than 400 per 1,00,000. Later Mc Dougal (1949) estimated mortality in tuberculosis as high as 200 per 1,00,000 in India. A longitudinal study to estimate the tuberculosis mortality was undertaken by Chakraborty et al (1968) from National Tuberculosis Institute during the period 1961-68. They found the annual cause specific death rate due to tuberculosis as 84 per 1,00,000 population. One can not loose sight of the fact that a mortality rate over 80/1,00,000 population is the highest death rate now in existance any where in the world.

Of all the manifestations of the tuberculosis pulmonary tuberculosis gets the maximum attention. There is however, justification, for the importance given to pulmonary disease, since it is the most frequent of all manifestations and is practically the only manifestation which is infectious.

The mortality in pulmonary tuberculosis usually occurs either due to tubercular toxæmia or due to progression of tuberculous lesion leading to respiratory insufficiency from supervening bronchitis, bronchiectasis emphysema and secondary infections.

The association of pulmonary tuberculosis with secondary infections may be seen very commonly in northern India as the disease has a very high incidence in this part of the country (Wig et al, 1964 and Gularia et al, 1969).

In normal subjects the lower (infralaryngeal) respiratory tract is bacteriologically sterile (Lees and Mc Naught, 1959). The upper respiratory passages however normally contain a variety of microorganisms including bacteria and fungi which may be potentially pathogenic if they invade lower respiratory tract.

Thus Pneumococci, Hemophilus influenzae, coagulase positive Staphylococcus, Hemolytic Streptococci, gram negative bacilli including coliforms and numerous anaerobic organisms are frequently isolated

from oropharyngeal secretions of normal subjects (Lees and Mc Naught, 1959).

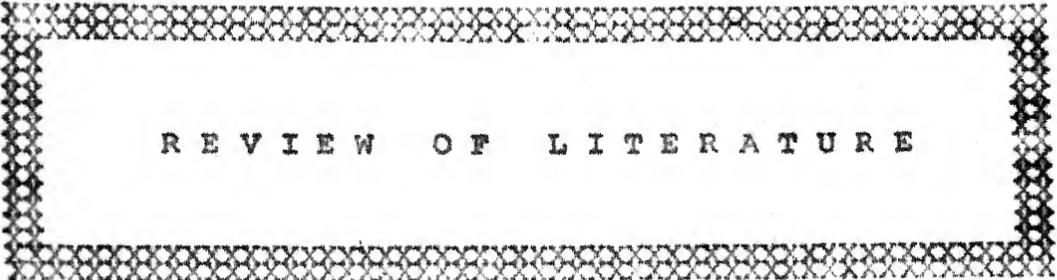
Although transient contamination of the lower respiratory tract with the organisms from oropharynx is not infrequent, particularly during sleep, these inocula are rapidly eliminated on account of the excellent defence mechanisms in the lungs (Green et al, 1977). Altered local defence mechanism and impaired mucocilliary clearance in patients with chronic bronchitis as well as in pulmonary tuberculosis may permit extension of the normal oropharyngeal flora into the lower respiratory tract (Jordan et al, 1976), causing further destruction of lung.

Due to invasion of secondary pathogenic organisms in the lower respiratory tract among the tuberculous patients in whom there is already poor defence mechanism, there is aggravation of the symptoms which result in progressive breathlessness, cough, large amount of expectoration some time associated with Hemoptysis and fever. Radiological deterioration may also be seen in serial radiography due to parenchymal destruction caused by secondary organisms. Therefore, in the management of pulmonary tuberculosis, secondary infections must get due attention.

The present study is being undertaken with the purpose of :-

1. To find out the bacterial flora of the upper and lower respiratory tract in cases of pulmonary tuberculosis.
2. To evaluate the impact of these secondary infections of lung in patients with pulmonary tuberculosis.

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REVIEW OF LITERATURE

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Tuberculosis is a disease of great antiquity. What were of most certainly tuberculous lesions have been found in the vertebrae of neolithic man in Europe and of Egyptian mummies perhaps as early as 3700 BC (Morre, 1964). Hippocrates (460-370 BC), the father of modern medicine described it as "PTHISIS" meaning to waste away.

Jerome Fracaster (1983) described the infectious nature of the disease. Franciscus Sylvius (1614-1672) found tubercles in the autopsy material of lungs in clinically diagnosed cases of tuberculosis. Richard Morton (1637-1668) in his famous book "PTHISIOLOGICA" (1689) wrote on clinical features of tuberculosis and distinguished it from other forms of pulmonary disease. In the Galaxy of great scientists who contributed to the progress of knowledge of tuberculosis, the top most honour goes to Sir Robert Koch who discovered and demonstrated the tubercle bacillus in 1982. In honour of Sir Robert Koch, the bacillus is often referred as 'Koch's bacillus and disease it causes as "Koch's disease".

X-ray, discovered in 1895 by Prof. Roentgen, were put to clinical use by 1904 which proved invaluable

for the diagnosis of tuberculosis. It was only in 1930 that a good X-ray picture of the chest could be obtained. A further advancement was made when Manoel de Abreu in Brazil after years of experimentation at last succeeded in getting a clear photograph of the shadow of the lung on the luminous screen and demonstrated the results to the medical society of Rio de Janeiro in 1936.

Tuberculosis has become the world's most important communicable disease. In economically developing countries the disease is one of the principal causes of suffering and death. It has been said that more people have died of tuberculosis than all those killed in two world wars.

PATHOGENESIS OF PULMONARY TUBERCULOSIS

Tubercle bacilli are strict aerobes and thrive best at PO_2 of about 140 mm Hg. The organs most commonly affected by tuberculosis are those with relatively high oxygen tension, metastatic foci are most common in the range of 120 to 130 mm Hg in the upright position.

Mycobacteria are nonmotile, nonsporulating weakly grampositive rods classified in the order actinomyceatales, while the bacilli do not have a waxy capsule, a high lipid content contributes to their acid fast staining characteristics. Obligate aerobes, tubercle

bacilli are usually recognised by their characteristic colonial morphology, lack of pigmentation, slow or delayed catalase activity and positive niacin test.

The clinical challenge of the disease process arises from the fact that infection with mycobacterium tuberculosis involves a life long relationship between the host (man) and the tubercle bacillus, a relationship in which dormant organism may remain alive in the host for life. While these bacilli are held in check primarily by the host's immunologic defense system, they remain capable of reactivating and causing a progressive and potentially life threatening disease "Tuberculosis". The infected host is a walking 'time bomb' in whom at any moment progressive disease may develop and in many cases, serve as a nidus for the spread of the infection to other members of the community.

Mycobacterium tuberculosis is usually spread as an airborne "droplet nucleus". These particles produced and disseminated as persons with pulmonary tuberculosis talk or cough, are small enough (1 to 10 mcg) to remain airborne for extended periods. When, inhaled, they pass through the mucocilliary airway defenses into the alveoli. Based on volume distribution of air within the lungs, the lower lung fields are usually the site of initial bacillary implantation.

Once secure within the alveoli of a susceptible host, tubercle bacilli multiply slowly, at a rate of about one multiplication every 24 hours. During the ensuing 3 to 10 weeks, while a cellular immune response is developing in the host, these bacilli may be transported through lymphatic channels, first to the regional hilar lymph nodes, and then into the blood stream via the thoracic duct. It is also possible for bacilli to enter directly into the pulmonary vasculature. Either way, organisms are seeded throughout the entire body of the host prior to the arrival of specifically reactive lymphocytes in sufficient numbers to bring the infective process under control.

In the absence of an adequate immunologic response, the end result of this early hematogenous spread is 'miliary' tuberculosis (Readily visible in the lung fields) and/or disseminated tuberculosis. It is important to emphasize that this initial asymptomatic lymphohematogenous dissemination probably occurs in all instances, and sets the stage for later "reactivation" to present clinically as pulmonary or extrapulmonary disease. Usually this infective process is controlled by activated macrophages brought to the sites of infection by specifically reactive lymphocytes. Although phagocytised by the macrophages, many of the tubercle bacilli remain viable and actually continue to multiply within the phagocytes. In most cases, this host defense

process controls further spread of the infection and the host/paracyte relationship settles into a state of equilibrium with some organisms being slowly destroyed as lesions heal but with significant numbers of bacilli retaining their viability in a dormant condition.

About 5 percent of hosts are capable of containing the initial infective process and an additional 5 percent of those who do pass successfully through this initial challenge later lose their capability of controlling the infection and dormant bacilli again begin to multiply "reactive" with resultant progressive disease.

Fibrocaceous tuberculosis may develop from either direct progression of the initial infection or recrudescence of a dormant lesion. There is tendency to chronicity, cavitation and production of fibrous tissue. While the solid caseation necrosis of the initial stage contains few bacilli the liquid caseum in a tuberculous cavity, contains abundant bacilli and may spread infection via bronchi, to other portion of the lungs and into environment.

Bronchi, trachea & larynx are protected from implantation of inhaled mycobacterium tuberculosis by a covering of secreted mucus but may become involved in patients with advanced cavitatory pulmonary tuberculosis who excrete numerous tubercle bacilli.

BACTERIOLOGY OF OROPHARYNGEAL SECRETIONS

The normal bacterial flora of the respiratory tract is acquired by the neonate within a few hours of birth apparently as a result of contact with other human beings, since most of these organisms are not free living in the environment. In adults, oropharyngeal secretions contain approximately 10^7 aerobic and 10^8 anaerobic bacteria per ml.

In a given individual the bacterial flora of the upper respiratory tract is remarkably constant (Kraus, 1956). Gradual shifts i.e. loss of some species and acquisition of others, occurs with time and sharing of organisms among family members is common.

Oropharyngeal flora is a complex assortment of aerobic and anaerobic bacteria. *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus viridans* even *Neisseria meningitidis* all potential pathogens, are often found in the oropharynx of healthy adults. Coliforms, such as *Escherichia coli*, *Klebsiella*, and *Proteus* are uncommon in the oropharynx of healthy adults. Pharyngeal carriage rates from normal subjects range from 2 percent (Johanson et al, 1969) to 11.5 percent (Rahal et al, 1970). Eighteen percent of 100 randomly selected people, free from any chronic upper or lower respiratory disease who did not work in a hospital and who had not

experienced any acute illness or received any antibacterial therapy in the four weeks preceding culture, were found to harbor either enterobacteriaceae or pseudomonas aeruginosa.

In chronically or severely ill patients, colonisation of the oropharynx is increased to 60 to 75 percent (Johanson et al, 1972). Hospitalized patients who are not critically ill have a far lower prevalence of approximately 30 to 40 percent. Colonization with gram negative bacilli is also increased in patients on antimicrobial therapy, alcoholics and diabetes. The most frequently encountered bacteria are Klebsiella, E.Coli and Enterobacter (Johanson, 1969). Cause of increasing colonization among ill patients is not known. Very recently Johanson, Woods, and Chaudhary (1979) demonstrated that epithelial cells of the upper respiratory tract contain binding sites for gram negative bacilli and that markedly more of these organisms adhere to epithelial cells recovered from colonized patients than to the cells of non colonized patients. They further suggested that this increased adherence, whether due to alterations in cells or to factors in oropharyngeal secretions, is the key abnormality that predisposes ill patients to subsequent colonization.

ROUTE OF ENTRY FOR BACTERIA IN TO THE LUNG

Distal airways and lung parenchyma are normally sterile, despite their proximity to oropharynx and presence of bacteria in inspired air. Bacteria have access to the pulmonary parenchyma by at least three routes. Microorganisms may enter the lung by inhalation of droplet nuclei. Organisms may also arrive in the lung via the blood. The majority of pulmonary infections caused by bacteria are thought to follow introduction of pathogenic organisms by aspiration of oropharyngeal contents. It is important to note that aspiration of even minute quantities of oropharyngeal secretions presents an enormous bacterial challenge to the distal lung. For example, 0.01 ml of aspirated secretions will contain about 10^5 aerobic bacteria where as inhalation of air, containing 15 organisms per m^3 , for 1 hour, will introduce approximately 10 organisms into the lung (Rosebury, 1962).

Amberson (1937) proposed years ago that nocturnal aspiration of oropharyngeal secretion was a common event. Huxley et al (1978) proposed that every one probably aspirates during deep sleep.

DEFENCE SYSTEM

The upper respiratory tract, which includes the nose, nasopharynx and larynx is lined by vascular mucous membrane. The whole respiratory epithelium down to the terminal bronchial is ciliated.

In the nose, pharynx, and tracheobronchial tree, the thrust of host defenses against infection is entrapment and rapid clearance of the infectious agent before extensive multiplication can occur. (New house M, Sanchis J, 1970). Components of this conductive zone defense include aerodynamic filtration Humidification and temperature adjustment of inspired air in the nose, pharynx and trachea, Epiglottis closure and cough, intact epithelial mucosa and mucociliary escalator of the tracheobronchial tree and surface antibodies (Gamma A). Beyond the terminal bronchioles in the gas exchange zone, clearance of particles by surface and other routes is slower. Thus acinar defence mechanisms focus on rendering infectious agents in capable of multiplication by investing, ingesting and killing of organisms (New House, M., 1976).

Components of this gas exchange defence include alveolar macrophages, especially for air born agents, surfactant, specific and nonspecific antibodies (Gamma G), polymorphonuclear leucocytes, especially for blood borne agents, compliments, 'B' and T cell lymphocytes and their products (Griffin, 1976).

BACTERIOLOGY OF LOWER RESPIRATORY TRACT

Bacteriological examination of the expectorated sputum has been the traditional method for the identification of pathogens in the lower respiratory

tract. In a recent analysis, however 75% of the expectorated specimens submitted for culture were found to be unsatisfactory (Murray and Washington, 1975). Some patients are unable to expectorate the sputum or its production is minimal in spite of significant bronchopulmonary infection. Results of sputum culture may be difficult to interpret on account of its contamination by the oropharyngeal flora, particularly the gram negative bacilli. These organisms are found to be present with great frequency in the oropharyngeal secretions of chronically ill patients or those who have received prior antibiotic therapy (Johanson et al, 1972). Repeated washing of expectorated sputum to wash out contaminated oropharyngeal flora has been advised. Presence of less than 10 epithelial cells and more than 20 leucocytes under the low power objective of the microscope represents acceptable sputum sample for lower respiratory pathogens by others.

Brumfitt and Willoughby (1958) have suggested that it may be useful to culture throat swabs as well as sputum, on the ground that if an organisms is recovered from sputum but not from the throat swab, it may be assumed that its source is in the lower respiratory tract, though not if it is recovered from both sputum and throat swab.

According to Lees and Mc Naught (1959) because of the liability to contamination with upper respiratory secretions, the bacteriology of sputum does not necessarily reflect the bacteriology of the bronchial tree. Organism can confidently be regarded as originating in the lower respiratory tract only, if they can not be cultured from the upper.

The bacteriology of chronic respiratory diseases varies from case to case, from place to place and has also shown changing pattern with changing seasons. Klebsiella species were found to be commonest organisms isolated from Indian patients (Agarwal et al., 1983) while pneumococci and Hemophilus influenzae were found to be most common pathogens in others (Bansted, 1950; Bruonfell, 1958 and Elmes, 1953).

Agarwal et al (1983) conducted a study to determine the non tubercular bacterial flora of sputum in patients suffering with pulmonary tuberculosis. Specimens such as bronchial swabs, sputum and upper respiratory tract (Throat) swabs were collected from 134 smear positive cases of pulmonary tuberculosis, 40 from these cases having minimal tubercular lesions - (Group A), 48 from those having extensive pulmonary tuberculosis but without bronchitis (Group B), and 46 from those having extensive pulmonary tuberculosis with chronic bronchitis (Group C) were subjected to

bacteriological cultures for the yield of non tubercular potential pathogens. Bronchial secretions from group A cases were found sterile. In group B of those with extensive pulmonary tuberculosis without bronchitis, the potential pathogens were found in 6 (12.5%) out of 48 bronchial swabs. Of these 3 were *Staphylococcus aureus*, 2 of *Pneumococci* and 1 *Hemophilus influenzae*.

It was found that in group C (46) cases with extensive pulmonary tuberculosis with chronic bronchitis, there was a comparatively high yield of potential pathogens such as *Pneumococci* (5 specimens), *Hemophilus influenzae* (4 specimens), *Staphylococcus aureus* (13 specimens) and *Klebsiella* (14 specimens) in bronchial swabs.

Klebsiella and *Staphylococcus aureus* were isolated predominantly from sputum and upper respiratory tract of all the three groups of cases. These findings suggest that in group C, the non tuberculous pathogens were the probable cause of chronic bronchitis as shown by high yield of potential pathogens from bronchial swabs in group C cases. An increasing breathlessness and extensive expectoration in chronic cases of pulmonary tuberculosis has previously been thought to be due to constant presence of tubercle bacilli. But from the present study, it has become clear that presence of potential pathogens in such cases is the real cause of constant dyspnoea and sputum production. Comparison of sputum and upper respiratory tract secretions in

this study shows that they are of little value as far as the choice of chemotherapy is concerned. The reason being that the potential pathogens detected from the sputum may either be derived from mouth or throat or from lower respiratory tract. If the organism were found both in upper respiratory tract and sputum then the source is usually uncertain, on the contrary, if potential pathogens are isolated from sputum only, they are coming from lower respiratory tract (Elmes et al., 1953).

Sharma and Jain (1981) studied bronchial aspirate in lower respiratory tract infections. Out of the thirteen cases with pulmonary tuberculosis, potential pathogens were grown in 5 (30.4%) bronchial aspirates (*Pseudomonas* in 2, *Klebsiella* in 1, *E.Coli* in 1 and *Streptococcus Hemolyticus* in 1). Benstead (1950) found potential pathogens in 58% cases and Lees and Mc Naught (1959) in 13% cases of uncomplicated pulmonary tuberculosis and in 75% cases of pulmonary tuberculosis with significant bronchitis. Potential pathogens were *Hemophilus influenzae* and *Pneumococcus*.

Mulder (1938), Elmes et al (1953) have reported *Pneumococcus* and *Hemophilus influenzae* as the commonest sputum pathogens in patients with pulmonary tuberculosis. Reid (1958) considered that potential pathogens are mostly found in lower respiratory

tract of patients with pulmonary tuberculosis as well as chronic bronchitis due to their constant trickling from upper respiratory tract.

Nigam et al (1983) while studying the effect of metronidazole in suppurative pleuro-pulmonary infections found that secondary bacterial infections were more common in patients suffering with pulmonary tuberculosis.

Johanson (1969) studied 51 patients of chronic respiratory diseases by transtracheal aspiration. Six patients were of cavitary tuberculosis. All the six patients were having pathogens which included *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Hemophilus influenzae* and enteric gram negative bacilli.

Patients with tuberculosis may develop one or more areas of lung necrosis. Although usually labelled "cavities" these lesions are really abscesses. In such lesions *Staphylococcus aureus*, *Klebsiella*, group A *Streptococcus* cause further tissue necrosis and formation of abscesses (Harrison's Text Book of Internal Medicine).

Bronchi which lie within tuberculosis lesions are regularly weakened by inflammatory process and dilated by contraction of fibrous tissue in healing. In the upper lobes this is rarely clinically significant but in portions of the lung which are dependent when the patient is upright, it may lead to secondary

infection, producing chronic productive cough and sporadic hemoptysis. Chronic generalized air ways obstruction is a very common disease in India. It along with secondary infections may thus co-exist with pulmonary tuberculosis (Harrison's Principles of Internal Medicine, 10th Edition).

ANTITUBERCULOSIS THERAPY AND SECONDARY BACTERIAL INFECTIONS

Streptomycin was the first important antibiotic discovered in the 1944 by Walksman (1944). It was soon introduced into the medicine for its bactericidal activity against mycobacterium tuberculosis and other penicillin ensensitive organisms like Escherichia Coli, Proteus-vulgaris, Pseudomonas aeruginosa, Hemophilus influenzae and Klebsiella pneumoniae. Another anti-tubercular drug Rifampicin has got activity against meningococcus and Staphylococcus (Lawrence - Clinical pharmacology).

BACTERIOLOGY OF CHRONIC RESPIRATORY DISEASE OF NON TUBERCULAR ORIGIN

Specimens of bronchial secretions, sputum and upper respiratory tract secretions were obtained from 14 normal subjects and 28 chronic bronchitics by Lees and Mc Naught (1959). Non pathogens, Neisseriae, viridans group of Streptococci, Diphtheroids, coagulase negative Staphylococci and non Hemolytic Streptococci

were frequently found in sputum and upper respiratory tract secretions of both 'Normal' and bronchitics. Bronchial secretions in the "Normal" subjects were sterile, but in the chronic bronchitics commonly contained potential pathogens - predominantly *Hemophilus influenzae* and the *Pneumococcus*. *Hemophilus influenzae* and the *Pneumococcus* were frequently found in the mouths and throats of both "Normal" and Chronic bronchitic subjects. These organisms were also found in sputum from normal subjects and as they were not present in bronchial secretions their source must have been the upper respiratory tract.

WORK OF WANNER ET AL

Wanner et al (1972) did the comparison among the bacterial flora of different segments of the respiratory tract. Thirty eight patients with broncho pulmonary infections and 14 patients with non infectious pulmonary disorders underwent bedside bronchofibrescopy for selective cultures of the lower air ways, with simultaneous upper respiratory tract cultures. In addition eight subjects with no evidence of cardio-respiratory disease were similarly studied. The group with bronchopulmonary infections consisted of 30 patients with pneumonia and eight patients with chronic obstructive lung disease. The group of 14 patients with noninfectious lung disorders included four with

congestive heart failure, four with lung tumors, two with recurrent pulmonary emboli and one patient each with bronchial asthma, pulmonary fibrosis, hemomediastinum and inactive pulmonary tuberculosis. Oropharyngeal commensurates in eight normal subjects were considered to include the *Neisseria* group, *Streptococcus viridans*, *Diphtheroids* and *Staphylococcus epidermidis*. In none of the eight normal subject were bacteria recovered from the bronchi, however, bacterial growth was found in the trachea of two of them. Of the 52 patients (38 patients with bronchopulmonary infections + 14 patients with non infectious disorders), all harbored oropharyngeal commensals and/or pathogens in the nasopharynx or expectorate sputum. In this study, the bacteriologic findings in the nasopharynx and expectorated sputum were lumped together as many patients were unable to produce a satisfactory sputum sample. Forty seven had bacteria in the trachea, but only 31 in the main bronchi. The predominant pathogens in the bronchi were coliforms (20 cases). *D pneumoniae* and *Hemophilus influenzae* comprised the remaining bronchial pathogens. The correlation between pathogens from the upper (nasopharynx and expectorated sputum) and lower (main bronchi) respiratory tract was analysed. The same pathogens were present in 18 patients (51%). However, in six of these, one to three additional pathogens were

cultured in the sputum but not recovered from the lower respiratory tract. Therefore, in only 12 patients (34%) it has been possible to identify the lower air way bacteria on the basis of the sputum culture or throat swab. This study pointed out the limited diagnostic value of cultures from expectorated sputum or throat swabs in these patients.

WORK OF BROWN AND STUART HARRIS et al, 1954.

In a previous paper Stuart Harris et al (1954) discussed the significance of the bacteria of a potentially pathogenic character found in the sputum of patients with chronic bronchitis. The view was formulated that a state of chronic colonization of the lower respiratory tract exists in chronic bronchitis perhaps as a result of a failure of defence against invasion by nasopharyngeal organism. This study was an effort to obtain data concerning the origin of bacteria in the sputum of patients with chronic bronchitis and emphysema. Nasopharyngeal swabs, sputum and bronchial aspirates were cultured from each patient. There were 16 patients of chronic bronchitis and emphysema and 8 patients of bronchial asthma. Surprisingly enough, patients with bronchial asthma were having very low (1 case) incidence of pathogenic bacteria in the sputum and none in bronchial aspirate of the sixteen patients of chronic bronchitis and emphysema. The strains of the *Pneumococcus*, *Haemophilus influenzae* and

Hemophilus parainfluenzae occur with great frequency in the sputum from these patients. The results of the bacteriologic examination of bronchoscopy specimens indicate that eight had similar pathogenic flora in the sputum (*Pneumococcus* and *Hemophilus influenzae*) and bronchial aspirate. The remaining eight had pathogenic bacteria in the sputum but not in the bronchial aspirate. The nasopharyngeal swab did not yield pathogenic bacteria with the same degree of frequency as did the sputum. Thus author concluded that (1) this study do not support the view that organisms in the sputum are derived from the nasopharynx during the process of expectoration. (2) The bronchoscopic specimens appear to establish an origin of the *Pneumococci* and other organisms from the lower respiratory tract in half of the patients studied.

Allibone, E.C.; Allison, P.R. and Zinnemann, K. (1943) studied the incidence of *Hemophilus influenzae* in bronchoscopic aspiration of 100 consecutive cases of bronchiectasis in young people in Leeds area (England). The investigations were based on one examination per patient. *Hemophilus influenzae* was found in 63%. In another series two years later Allison et al (1945) reported that *Hemophilus influenzae* was the predominant organism in cultures from bronchoscopic aspirations of the 32 children. This corresponds to an isolation rate of 84.4% which is 20% higher than in the three times larger adults series of Allison et al (1943). In

authors opinion the above observations leads with certainly to the conclusion that the group of non-encapsulated *Hemophilus influenzae* is a pathogen and not a saprophyte of the mucous membrane of the bronchial tree. They said that the etiology of bronchitis and that of bronchiectasis cannot possibly be understood if the part played by *Hemophilus* infection is overlooked. The conclusion is inescapable that non capsulated *Hemophilus influenzae* is responsible for keeping the chronic inflammatory process smouldering in bronchiectatic individuals. Administration of antibiotics and their activity against capsulated and non capsulated *Hemophilus influenzae* strains was investigated with a view to using them as tools in further investigations and in the therapy of chronic bronchitis. High doses of a suitable combination of antibacterial drugs bring about simultaneous disappearance of pus and *Hemophilus influenzae* in sputum of bronchitis. More over, in the majority of relapses with marked purulence of the sputum, *Hemophilus* reappears in large numbers.

Franklin and Garrods (1953) reported the effectiveness of systemic chloramphenicol in, reducing the amount of sputum, and at the same time eliminating pus and *Hemophilus influenzae* from the sputum of bronchiectatic patients.

May (1960) stressed the inhomogenous character of the sputum in cases of chronic bronchitis and by using multiple sampling techniques for each specimen has correlated the presence of Pneumococci and Hemophilus influenzae in the sputum. Hemophilus influenzae as a causative organism in chronic respiratory disease has been investigated by Mulder, (1940).

One hundred cases of chronic respiratory diseases of non tubercular origin were studied for bacteriology by Tankiwala et al (1984). In sputum culture Klebsiella species were isolated with highest frequency being demonstrated in 38(41.30%) cases, coagulase positive Staphylococci were isolated in 23.0% cases and Diplococcus Pneumonia in 21.73% cases. Bronchial aspirates showed growth of Klebsiella and coagulase positive Staphylococci in 42.3% and 38±0.1% cases respectively. An attempt was made to correlate the growth of organisms in sputum as well as bronchial aspirates. A good correlation was observed in 26 cases suggesting that they were definite pathogens while 4 cases did not reveal any growth in bronchial aspirate, the only growth in sputum suggests that they might be contaminates from oropharynx.

Bronchoscopic aspiration was carried out in 30 patients using fibreoptic bronchoscope and culture results compared with sputum culture in an attempt to

determine bacteriology of lower respiratory tract by Raj Baldev et al (1985). From culture of bronchial aspirate from lower respiratory tract pathogens could be grown in 21 (70%) patients. Out of which 4 patients harboured more than one pathogens while on the sputum culture pathogens could be grown in 23 (76.6%) patients. *Klebsiella* and *Staphylococcus aureus* were predominantly pathogens grown.

As regards the importance of *Klebsiella* as a respiratory pathogen, a survey was carried out between 1862 and 1864 in England. *Klebsiella* species were isolated from 101 patients and were regarded as significant pathogens. In his paper Dr Burns (1968) discussed the relation of *Klebsiella* to chronic respiratory diseases. Organisms of this group may be present in the sputum of patients with chronic bronchitis for long periods of time.

Various factors are said to be implicated in the production of chronic bronchitis, among which repeated infections, allergy, atmospheric pollution and cigarette smoking are probable most important. Whatever the factors involved in inception of chronic respiratory diseases, infection must play an important role. Harry F. Dowling (1959) has reviewed some of the important papers published on this matter viz. Stuart-Harris in their early study found *Haemophilus influenzae* in 15% of the sputum of patient with chronic bronchitis. Later, Stuart-Harris in association with

Brown and other workers reported *Hemophilus influenzae* in the sputum of 51% of patients with chronic bronchitis and when sputum from the same patients was examined repeatedly over a period of a month in 70% of patients. These patients were studied in Albany, New York. May and Oswald stated that *Hemophilus influenzae* was isolated in their laboratory from 80 to 90% of patients with chronic bronchitis with purulent sputum. *Pneumococci* has been reported to be present in 10 to 74% of sputum specimens according to various observers. *Staphylococcus aureus* was reported in 2 to 30% of sputum samples by same workers. Beta hemolytic *Streptococci* were found only occasionally in these patients. *Neisseria catarrhalis* *Diphtheroids* and *Streptococci* were found frequently in cultures from the upper air passage in normal persons and are, therefore, not reported in most series.

Harry F. Dowling and associates in their own study treated eighty nine patients with bronchiectasis and chronic bronchitis for periods from three to thirty one months either with tetracycline, penicillin and oleandomycin-penicillin mixture or sucrose placebo tablets. Bacteriologic studies of the sputum were made at monthly intervals. *Hemophilus influenzae*, *Staphylococcus aureus* and *Pneumococcus* were considered to be the most important pathogens. Tetracycline or oleandomycin

penicillin therapy caused a significant diminution in the frequency with which the micro-organisms were cultured from sputum. Tetracycline was particularly effective in decreasing the frequency with which *Hemophilus influenzae* was found in sputum. No significant increase in other potentially pathogenic bacteria was observed except for *Proteus* in the oleandomycin-penicillin group and *Pseudomonas* in the tetracycline group. In none of the patients did these micro-organisms appear consistently in the sputum after therapy. A definite seasonal incidence was seen in the frequency with which *Hemophilus influenzae* could be cultivated from specimens of sputum isolates being more frequent in the colder months of the year.

Reviewing the association of the bacteriological finding in chronic bronchitis with respect to pulmonary tuberculosis it is seen that chronic bronchitis is a very common disease in males of the age which also show the highest attack rate of pulmonary tuberculosis. It is not surprising therefore, that the two diseases frequently co-exist, especially as both may be related to smoking. The possibility that chronic bronchitis and asthma may predispose to tuberculosis has been considered (Birath, G., Caro J., 1966; Krukniel J., Q.O. Rien, 1961). It has been mentioned that diffuse airways obstruction is most

frequently found in older patients with chronic diffuse pulmonary tuberculosis (Kreukniet J., 1961; Lancaster J.F., 1902). In such patients there is often recurrent secondary infection and the clinical manifestations, apart from the radiological residua of the tuberculosis are virtually identical with those of chronic bronchitis.

In pulmonary tuberculosis as well as in the chronic bronchitic patients these infections almost always descent into the lower respiratory tract resulting in exacerbations of cough, purulent sputum and often wheeze. Such exacerbations become worse over the years and tend to last for longer and longer periods. Pathological evidence (Reidlyne, 1958) has suggested that each of these exacerbations produce a little further lung damage and effect a little more permanent deterioration in respiratory function adding to that already produced by tubercle bacilli.

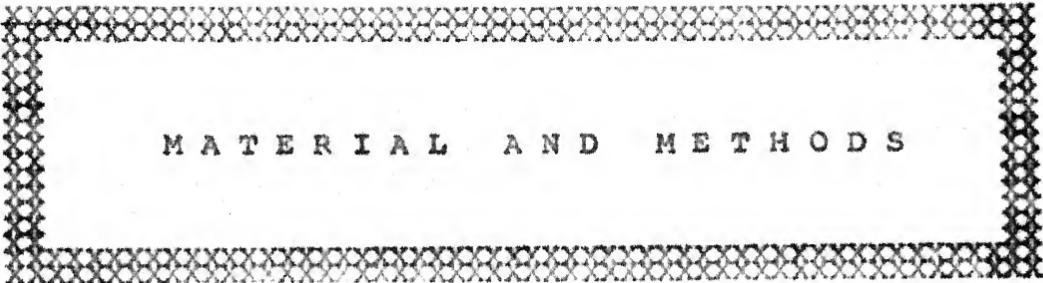
Besides its importance in association with obstruction it is possible that infection can produce bronchiectasis by damage to the bronchial wall. When bronchograms are done in post primary pulmonary tuberculosis, bronchiectasis is almost universal (Boyer, 1946; Darmer et al., 1945).

Growth of these organisms within the lung may be enhanced not only by the destruction of mucus

membrane loss of ciliary mechanisms and hindered drainage of mucus but also by factors such as alcohol intake, smoking, hypoxia, starvation, diabetes mellitus, old age and the administration of corticosteroids drugs (Kars, Edward, 1963).

Thus routine bacteriology should be indensible as a guide to start antitubercular chemotherapy. The association of pulmonary tuberculosis with secondary bacterial infections still need lot of work specially in the field of knowing relation of duration and severity of pulmonary tuberculosis with secondary bacterial infections. The effect^s of antituberculosis drug therapy particularly Rifampicin and Streptomycin over the yield of potential pathogens and ultimately the impact of these secondary bacterial infections on the morbidity and mortality need well planned study.

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M A T E R I A L A N D M E T H O D S

M A T E R I A L A N D M E T H O D S

The present study was conducted on patients of pulmonary tuberculosis admitted to the wards of the departments of Medicine and T.B. & Chest diseases, M.L.B. Medical College, Hospital, Jhansi. Bacteriological study was done in the department of Pathology and Microbiology. The diagnosis of pulmonary tuberculosis was suspected by history, physical examination, and confirmed by X-ray chest and/or sputum examination for A.F.B.. Detailed history included age, sex, occupation, socio-economic status, total duration of illness, treatment taken and family history. Symptoms like fever, breathlessness, hemoptysis, chest pain, weight loss and history of cough and expectoration were noted. Details of sputum viz. amount of sputum in 24 hours, colour, smell and postural relation were enquired.

A general examination of patient was done including general condition, pulse, blood pressure, temperature, respiration, pallor, edema, lymph nodes, clubbing, cyanosis, jaundice. Detailed clinical examination of respiratory system was done by inspection, palpation, percussion and auscultation serially.

INVESTIGATIONS

The following investigations were performed :

1. Total Leucocyte count (TLC).
2. Differential Leucocyte count (DLC).
3. Hemoglobin (Hb gm%)
4. Erythrocyte Sedimentation Rate (ESR).
5. Urine for Albumin, sugar and microscopic examination.
6. Blood sugar (F/PP).
7. Throat swab gram's staining and culture.
8. Sputum for gram's staining and Acid fast bacilli (Zeihl Nelson Method).
9. X-ray chest P.A. view.

CLASSIFICATION OF SEVERITY OF LUNG LESION

According to National Tuberculosis Association, U.S.A. (1961).

1. Minimal

Minimal lesions include those which are of slight to moderate density but which do not contain demonstrable cavitation. They may involve a small part of one or both lungs, but the total extent regardless of distribution, should not exceed the volume of lung; on one side above the second chondro-sternal junction or the spine of fourth or the body of fifth thoracic vertebra.

2. Moderately advanced

Moderately advanced lesion may be present in one or both lungs but total extent should not exceed to following limits. Disseminated lesion of slight to moderate density, which may extend to total volume of one lung or the equivalent in both lungs. Dense and confluent lesions which are limited in extent to one third the volume of one lung, total diameter of cavitation if present must be less than 4 cms.

3. Far advanced

Lesions more extensive than moderately advanced.

BACTERIOLOGICAL TECHNIQUES

From each patient, upper respiratory swab (Throat swab) and sputum were collected by standard techniques (Cruick-shank, 1975).

METHOD OF SPUTUM COLLECTION

In all cases early morning sample of sputum was collected aseptically in a sterile petridish by asking the patient to cough in a petridish after thorough mouthwash. The sample was then homogenised with sterile glass beads for heterogenous distribution of organisms. The sample was then washed with sterile saline three times to eliminate contaminants from oropharynx (Harry Dawling et al, 1960).

Gram's stain smear was prepared from sputum which was then examined for the presence of squamous epithelial cells (SEC) and leukocytes under the low power objective (10 x) of the microscope. If there were fewer than 10 SEC and greater than 25 leukocytes per field, it was considered adequate to represent lower respiratory tract flora on sputum culture.

ZIEHL NELSON METHOD OF SPUTUM EXAMINATION

The sputum examination for A.F.B. was done with the help of Ziehl Nelson staining technique which consisted the following steps.

1. Sputum smear was made, dried and fixed by flaming.
2. The slide was covered with filtered carbol Fuchsin and heated untill steam rises. Allowed the preparation to stain for 5 minutes, heat was applied at intervals to keep the stain hot.
3. Washed with water.
4. Covered the slide with 20 percent sulphuric acid. After about a minute in the acid, washed the slide with water and pour on more acid. Repeated this process several times. The decolourization was finished when after washing the field was faintly pink.
5. Washed the slide well with water.
6. Treated with 95% alcohol for 2 minutes.
7. Washed with water.

8. Covered with Löffler's methylene blue or dilute malachite green for 15-20 seconds.
9. Washed, blotted, dried and mounted the slide. Acid Fast Bacilli stained bright red while the tissue, cells and other organisms were stained blue or green according to the counter stain used.

Gram's Staining

1. Made a smear and fixed it by heating gently.
2. Poured on it methyl violet and kept aside for 2 minutes.
3. Poured off the methyl violet and washed the slide with gram's iodine keeping the later for 1 minute.
4. Washed the slide with water.
5. Decolourised the smear with alcohol or acetone till the violet colour stops coming out.
6. Washed with water.
7. Counter stained with a few drops of sofranin only for 30 seconds - 1 minute.
8. Washed again with water.
9. Allowed smear to dry and then studied under the microscope.

CULTURE OF SPECIMENS AND IDENTIFICATION OF BACTERIA

Within one hour of collection, samples from all sites were inoculated on to blood agar plates, which were incubated at 37^{°C} in an atmosphere of 5-10%

carbon dioxide for eighteen to twenty four hours. This enhanced the growth and mucoid characteristics of Pneumococci while also allowing the preliminary identification of Staphylococci, Streptococci, Hemophilus influenzae and coliforms organisms. At the same time all specimens were inoculated on ^{to} / nutrient agar plates. Incubation was carried out ^{at} / 37°C for eighteen to twenty four hours in air. The presence of Staphylococci was reported only if a strain produced coagulase on tube testing. Gram negative coliform bacilli were identified by their colonial appearances on blood agar and by their ability to grow on Mc conkey agar. Final identification was done by their motility and standard biochemical tests, which are described below.

Pneumococcus

Streptococcus Pneumoniae is a gram positive encapsulated organism that usually grows in pairs or short chains. Diplococcus form is lancet shaped. Pneumococcal colonies are surrounded by Greenish discolouration on blood agar and are confused at times with other alpha-hemolytic Streptococci such as Streptococcus viridans. Pneumococci can be distinguished by their bile solubility and optochin disk sensitivity test.

Streptococcus Pyogens

Group A Streptococci are gram positive cocci which may be found in pairs but more commonly occur as chains in specimens. They are catalase negative, aerobic but are some time facultative anaerobes. On blood agar plates, they appear as white to gray colonies 1 to 2 mm in diameter surrounded by zones of complete hemolysis or beta hemolysis. Bacitracin disc sensitivity is used for routine identification, but is by no means specific. Final identification is made with use of specific antisera.

Staphylococcus aureus

It is gram positive coccus. On gram stain, organisms are usually in clusters, but can occur singly or in pairs. On blood agar plates, colonies appear golden yellow, hence the name "aureus". Tests that differentiate *S. aureus* from the less pathogenic species *S. Epidermidis* (coagulase -ve) and *S. Saprophyticus* are the coagulase and Mannitol fermenting tests. More than 95 percent of pathogenic Staphylococci produce coagulase.

Hemophilus Influenzae

Hemophilus influenzae is an aerobic gram negative pleomorphic organism. They are unencapsulated. These strains are present in the mucoid sputum of 50 to 60 percent of patients with chronic bronchitis. Capsulated strains are found less commonly. *Hemophilus influenzae* requires both X and V factors for growth.

These requirements particularly V factors are available in culture media with peptic digest blood (Fildes) or heat disrupted erythrocytes (LEVINTHAL's agar and chocolate agar). Thus organism grows poorly if at all on ordinary blood agar because of the unavailability of V factor.

Klebsiella

Klebsiella species are encapsulated gram negative bacilli. Strains of Klebsiella usually are nonmotile and form large mucoid colonies on solid media. Strains of Klebsiella can be further distinguished on the basis of type-specific capsular antigens.

Escherichia Coli

It is a group of gram negative non sporing rods. They generally ferment lactose, as opposed to the non lactose fermenting organisms, such as Salmonella, Shigella and Proteus.

Proteus

It consists of gram negative bacilli which do not ferment lactose and are characterized by their active motility and spreading growth on solid media.

Pseudomonas

Pseudomonas aeruginosa is a gram negative motile rod. It grows readily in all ordinary culture

media and on agar it forms irregular, shoft iridescent colonies which usually have a fluorescent yellow green colour due to diffusion into the medium of two pigments, Pyocyanin and fluorescin. Pseudomonas produces acid but no gas in glucose, and it is proteolytic. It is oxidase positive and produces amonia from arginine.

Total number of patients in this study were one hundred twenty. These cases were divided into three groups :-

A. Minimal tuberculosis without bronchitis

These were cases with very mild tuberculous lesion, non cavitatory type. They did not show any evidence of bronchitis.

B. Extensive pulmonary tuberculosis
Without Bronchitis

These cases had multizonal involvement of lungs with a duration of 5 to 10 years. They also gave a history of extensive antitubercular chemotherapy which they had prior to their hospitalization. They did not have any bronchitis.

C. Tuberculosis with chronic bronchitis

These cases had extensive bilateral multizonal cavity type of tuberculous lesions of more than 5 years duration with chronic bronchitis in the form

of persistent or intermittent cough, sputum production wheezing and breathlessness.

All the datas were analysed statistically and conclusion drawn.

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OBSERVATIONS

O B S E R V A T I O N S

A total of 120 patients of pulmonary tuberculosis were studied over a period of 10 months, so as to elucidate the presence of secondary bacterial infections in these cases. The analysis hence forth will attempt to establish the role of bacterial flora of lower respiratory tract in pulmonary tuberculosis.

Age

Table 1 shows the age wise breakup of the cases. More than 1/3rd of the male patients fell in the age group 41-50 years. There were comparatively fewer cases in younger age groups. In the female group 2/3rd of patients fell in the 21-30 years of age.

Table 1

Showing the age and sex distribution of 120 cases.

Age group (years)	Male		Female		Total	
	No.	%	No.	%	No.	%
10 - 20	6	6.52	-	-	6	5.00
21 - 30	15	16.30	18	64.29	33	27.50
31 - 40	15	16.30	6	21.43	21	17.50
41 - 50	32	34.78	2	7.14	34	28.33
51 - 60	12	13.04	2	7.14	14	11.67
61 - 70	12	13.04	-	-	12	10.00
Total	92	100.00	28	100.00	120	100.00

Sex

Table 1 also shows sex wise breakup of the cases. There were 92 (76.66%) males and 28 (23.38%) females.

Socio-economic Status

Table 2 shows the socio-economic status of pulmonary tuberculosis patients. Fifty percent patients were in the social class III and another 40% in social class IV. Thus tuberculosis tends to attack the lower socio-economic classes.

Table 2

Showing the socio-economic status of the study group.

Social Class* (Mean/capita income: Rs./month)		No. of cases	Percentage
I	600	-	-
II	300 - 599	2	1.67
III	140 - 299	60	50.00
IV	60 - 139	48	40.00
V	< 60	10	8.33
Total		120	100.00

* Based on the criteria given by Srivastava et al (1981).

Family history of tuberculosis

Table 3 shows that 25% cases were having positive family history of pulmonary tuberculosis.

Table 3

Family history of pulmonary tuberculosis cases.

Family history	No.of cases	Percentage
Positive	30	25.00
Negative	90	75.00
Total	120	100.00

Rural - Urban

It is obvious from the table 4 that over 65% of pulmonary tuberculosis patients were from rural areas of Bundelkhand region.

Table 4

Showing rural-urban distribution of the cases.

Habitat	No.of cases	Percentage
Rural	78	65.00
Urban	42	35.00
Total	120	100.00

Occupation

Table 5 shows the occupational status of pulmonary tubercular patients. It is apparent that most victims of pulmonary tuberculosis are labourers.

Table 5

Showing occupational status of the cases.

Occupation	No. of cases	Percentage
House wife	28	23.33
Labourer	85	70.83
Office worker	2	1.67
Student	5	4.17
Total	120	100.00

Personal habits

Table 6 shows the personal habits of the cases of the study group. Nearly 50 percent cases were smoker and 20% were alcoholic. Fifty percent cases were addicted to tobacco chewing.

Table 6

Showing the personal habits of the study group cases.

Variable	No. of cases	Percentage
Smoker	60	50.00
Alcoholic	24	20.00
Tobacco chewing	60	50.00

Symptomatology

Table 7 shows symptomatology of cases suffering from pulmonary tuberculosis. General symptoms such as tiredness, loss of appetite, malaise

and loss of weight were present in nearly 95% cases. The advanced cases were having febrile symptoms (80%). Night sweats were classical symptoms of pulmonary tuberculosis (62.5%). Cough was the out standing manifestation seen in 100% cases. Sputum production was present in all cases. Sputum in pulmonary tuberculosis was either mucoid, mucopurulent or purulent in equal proportion of cases. Frank hemoptysis was a classical symptom of pulmonary tuberculosis seen in 30% cases. It varied from mere blood staining to sputum to the sudden eruption of half a liter or more of blood. Pain in the chest was present in 73.33% cases. Breathlessness was present in 80% cases. Recurrent colds for a number of months before the diagnosis was seen in more than 2/3rd of cases. Swelling over the body was seen in 16.67% cases.

Table 7

Showing the symptomatology of the cases of the study group.

Sl. No.	Symptoms	No. of cases	Percentage
1.	General Tiredness, malaise, loss of appetite, loss of weight.	114	95.00
2.	Fever	96	80.00
3.	Night sweats	75	62.50
4.	Cough	120	100.00
5.	Expectoration :		
	Mucoid	38	31.67
	Mucopurulent	40	33.33
	Purulent	42	35.00
6.	Hemoptysis	36	30.00
7.	Pain in the chest	88	73.33
8.	Breathlessness	96	80.00
9.	Recurrent attacks of colds	82	68.33
10.	Dyspepsia	15	12.50
11.	Swelling over body	20	16.67

Duration of the illness

Table 8 shows the duration of the illness at the time of study in pulmonary tuberculosis patients. Ten percent were having symptoms of less than 3 months duration. Nearly one quarter of patients were having symptoms for 2-3 years. Forty three percent were having duration of illness ranging from 3-5 years before their inclusion into the study.

Table 8

Showing the duration of illness
in the study group.

Duration of illness (months)	No.of cases	Percentage
Upto 3	12	10.00
4 - 6	10	8.33
7 - 12	8	6.67
13 - 24	6	5.00
25 - 36	32	26.67
37 - 60	52	43.33
Total	120	100.00

Table 9

Antitubercular therapy at the begining of the study.

Type of treatment	No.of cases	Percentage
Treatment started first time	12	10.00
On regular treatment	18	15.00
Taking irregular treatment	90	75.00
Total	120	100.00

Table 9 depicts the status of antitubercular therapy at the time of inclusion in the study. First time treatment was started after the diagnosis in 12 (10%) cases. Regular treatment since their diagnosis was taken by 18 (15%) cases. Irregular treatment which meant stoppage of drugs by the patients was recorded in 90 (75%) cases.

InvestigationsTable 10

Showing investigations in the study group.

Investigation		No.of cases	Percentage
<u>Blood cell counts</u>			
Polymorphs	765%	20	16.67
	<65%	100	83.33
Lymphocytes	745%	36	30.00
	<45%	87	72.50
E.S.R. 720 mm for 1st hour		120	100.00
Hemoglobin	711.5 gm%	15	12.50
	<11.5 gm%	105	87.50
<u>Biochemical</u>			
Abnormal glucose tolerance		12	10.00
Raised serum cholesterol		8	6.67
Albuminuria		8	6.67
Hypoproteinemia		20	16.67
<u>Sputum for A.F.B.</u>			
Positive		100	83.33
Negative		20	16.67
<u>X-ray Chest P.A. view</u>			
Minimal lesion		30	25.00
Moderately advanced		10	8.33
Far advanced		80	66.67

Table 10 shows results of various investigations. In all patients total leucocyte count (TLC) was within normal range i.e. 3000-11000/cumm. Differential

leucocyte count (DLC) showed that 16.67% cases were having polymorphonuclear leucocytosis whereas 30% cases were having lymphocytosis. Erythrocyte sedimentation rate (ESR) was raised in all cases. Majority of cases (87.5%) were having hemoglobin ≥ 11.5 gm% whereas only 12.5% cases were having < 11.5 gm%. Diabetes could be established in 10% cases as suggested by their abnormal glucose tolerance test. Features of nephrotic syndrome i.e. albuminuria, hypoproteinemia and hypercholesterolemia were seen in 6.67% cases. In rest cases hypoproteinemia was non renal in origin. Acid fast bacilli in the sputum were reported positive in 83.33% cases. Radiology revealed minimal tuberculosis in 25% cases, moderately advanced in 8.33% and far advanced lesions in 66.67% cases.

Bacteriological findings

Out of 120 cases as shown in table 11, 47 (39.17%) yielded potential pathogens in their upper respiratory secretions (Throat swab) and 77.5% in sputum culture. The various non pathogens recovered from these specimens such as Streptococcus viridans, Diphtheroids, Staphylococcus albus (coagulase negative) and non Hemolytic Streptococci have not been mentioned. They have been grouped together as non pathogens.

Table 11

Showing potential pathogens in 120 cases.

Group	No. of cases	Pathogens in			
		Throat swab		Sputum	
		No.	%	No.	%
Minimal tuberculosis	30	10	33.33	22	73.33
Moderate to extensive tuberculosis without chronic bronchitis	30	12	40.00	24	80.00
Extensive tuberculosis with chronic bronchitis	60	25	41.67	57	95.00
Total	120	47	39.17	93	77.50

Table 12 shows growth of various pathogens in throat swab from 120 cases of pulmonary tuberculosis. Klebsiella was seen in 18.33% cases. Staphylococcus aureus in 10% cases and Streptococcus Hemolyticus and Pneumococcus in approximately 5% cases. In rest (60.83%) cases non pathogens were grown.

Table 12

Showing growth of various organisms from throat swabs in 120 cases of pulmonary tuberculosis.

Organisms	No. of cases	Percentage
Klebsiella	22	18.33
Staphylococcus aureus	12	10.00
Streptococcus hemolyticus	7	5.83
Pneumococcus	6	5.00
Non pathogens	73	60.84
Total	120	100.00

Table 13 shows the growth of various organisms from sputum culture in 120 cases of the study group. In the sputum yield of potential pathogens was high. Klebsiella was grown from 44.17% cases followed by Staphylococcus aureus in 15.83% cases and then Pneumococcus and Streptococcus hemolyticus in 9.17% and 8.33% cases respectively.

Table 13

Showing growth of various organisms from sputum culture in 120 cases of pulmonary tuberculosis.

Organisms	No. of cases	Percentage
Klebsiella	53	44.17
Staphylococcus aureus	19	15.83
Streptococcus Hemolyticus	10	8.33
Pneumococcus	11	9.17
Pseudomonas	3	2.50
Proteus	2	1.67
Hemophilus influenzae	4	3.33
E. Coli	1	0.83
Non pathogens	17	14.17
Total	120	100.00

Table 14 depicts the correlation of bacterial growth in sputum and throat swab specimens. It is apparent from the table that in throat swab specimens Klebsiella is present in 22 while in sputum specimens it is present in 53. Staphylococcus aureus is present

in 12 specimens in throat swab while in sputum specimens it is present in 19 specimens. Streptococcus hemolyticus is present in seven specimens of throat swab while it is present in 10 specimens of sputum. Pneumococcus was seen in 6 and 77 specimens of throat and sputum respectively. In the sputum some different pathogens viz. Pseudomonas aeruginosa, Proteus, E. Coli and Hemophilus influenzae were grown which were not present in throat swabs.

Table 14

Showing the correlation of bacterial growth in sputum and throat swab specimens.

Organisms (Bacterial growth)	Specimens	
	Throat swab	Sputum
Klebsiella	22	53
Staphylococcus aureus	12	19
Streptococcus hemolyticus	7	10
Pneumococcus	6	11
Pseudomonas aeruginosa	-	3
Proteus	-	2
E. Coli	-	1
Hemophilus influenzae	-	4
Non pathogens	73	17
Total	120	120

Table 15 shows the correlation between pathogens isolated from throat swab and sputum in 93 cases in which sputum yielded pathogens.

Same pathogens were present in throat swab and sputum in 47 cases while in 46 cases though the pathogens were recovered from sputum culture but not from throat swab culture.

Table 15.

Showing correlation of pathogens in 93 cases.

Pathogens	No. of cases	Percentage
Same pathogens	47	50.54
Pathogens in sputum only	46	49.46
Total	93	100.00

Table 16 shows yield of non tuberculous bacterial pathogens obtained in 30 patients with minimal tuberculosis (Group A). In throat swab isolation of potential pathogens was seen in 33.33 percent specimens. Klebsiella was isolated in 5 specimens. Staphylococcus aureus from 3 specimens. On specimen each also showed growth of Pneumococcus. In sputum culture

isolation of pathogens was in 73.33% specimens. Klebsiella was the predominant pathogen in 12 specimens, followed by Staphylococcus aureus in 4 specimens, Streptococcus hemolyticus in 2 and Hemophilus finfluenzae in 1 specimen.

Table 16

Showing comparison of bacterial flora of 30 cases with minimal tuberculosis.

Specimens	No. of cases studied	Culture (+) No.	%	Klebs- iella	Pneumo- coccus	Staph. Aureus	Strep. Hemo.	Pseudo monas	E. Coli	Hemo. Influe.	Non Pathogen
Throat swab	30	10	33.33	5	1	3	1	-	-	-	20
Sputum	30	22	73.33	12	2	4	2	1	-	1	8

Staph. = Staphylococcus.

Strep. Hemo. = Streptococcus hemolyticus.

E.Coli = Escherichia Coli.

Hemo. Influe. = Hemophilus influenzae.

Table 17 shows comparison of bacterial flora of patients with moderate to extensive tuberculosis without chronic bronchitis. From upper respiratory tract a total positivity for potential pathogens was found in 40% specimens. Klebsiella was again a predominant isolate found in 5 specimens. Other common organisms were Staphylococcus aureus in 3 specimens, Streptococcus Hemolyticus in 2 specimens collected. In none of the specimens, Hemophilus influenzae was isolated. Total pathogens isolated from sputum specimens were 80%. Klebsiella was found in 11 specimens, Staphylococcus aureus in 5, Pneumococcus in 3, Streptococcus Hemolyticus in 4 and Hemophilus influenzae in 1 specimen.

Table 17

Showing comparison of bacterial flora of cases with moderate to extensive tuberculosis without chronic bronchitis.

Specimens	No. of cases studied	Culture (+) No.	%	Klebsiella	Pneumococcus	Staph. Aureus	Strep. Hemo.	Pseudo-monas	E. Coli	Hemo. Influe.	Non Pathogen
Throat swab	30	12	40.00	5	2	3	2	-	-	-	18
Sputum	30	24	80.00	11	3	5	4	-	-	1	6

Staph. = Staphylococcus.

E. Coli = Escherichia Coli.

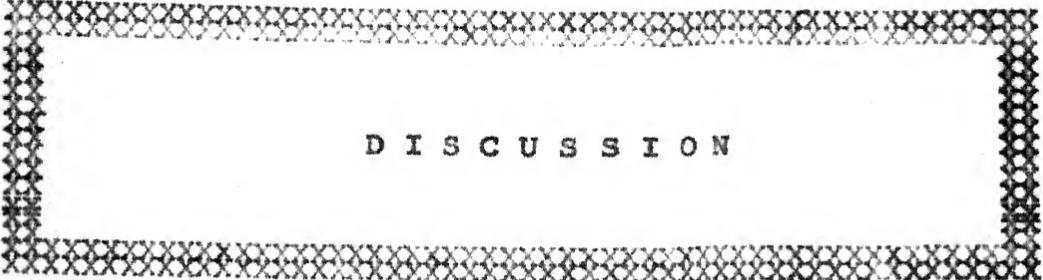
Strep. Hemo. = Streptococcus Hemolyticus.
Hemo. Influe. = Hemophilus influenzae.

Table 18 shows the distribution of potential pathogens in 60 cases of group C with moderate to extensive tuberculosis with chronic bronchitis. From upper respiratory tract (throat swab) culture, bacteriological yield was 41.67%, Klebsiella was found in 12 specimens, Staphylococcus in 6 specimens, Streptococcus hemolyticus in 4 and Pneumococcus in 3 specimens. In sputum culture total yield of potential pathogens was 95%, Klebsiella was predominant isolate in 30 specimens, followed by Staphylococcus aureus in 10 specimens, Pneumococcus in 6 specimens, Streptococcus Hemolyticus in 4, Pseudomonas aeruginosa, Proteus Hemophilus influenzae in 2 specimens each and E.Coli in 1 specimen.

Table 18

Showing comparison of bacterial flora of cases with moderate to extensive tuberculosis with chronic bronchitis.

Specimens	No. of cases studied	Culture (+) No.	%	Klebsiella	Pneumococcus	Staph. aureus	Strep. Hemo.	Pseudo-mona	E. Coli	Hemo. Influe.	Proteus	Non Patho
Throat swab	60	25	41.67	12	3	6	4	-	-	-	-	35
Sputum	60	57	95.00	30	6	10	4	2	1	-	2	3
Staph. = Staphylococcus.										Strep. Hemo. = Streptococcus Hemolyticus.		
E.Coli = Escherichia Coli.										Hemo. influe. = Hemophilus influenzae.		
Non Patho. = Non pathogen.												



DISCUSSION

DISCUSSION

Tuberculosis, a world wide malady, has been posing a great threat, specially in developing countries. Foci of tuberculosis may remain dormant for long time and produce clinical disease many years later. Progressive pulmonary tuberculosis is unusual before puberty. In this study of 120 cases, maximum number of cases were between the age group of 41-50 years in the males and between the age group 21-30 years in the females. About two third of cases were males. The greater preponderance of males reflected the general trend of males more frequently seeking medical help and the greater proportion of male beds in our hospital. Increased incidence of tuberculosis in young females is much debated and perhaps is due to hormonal factors. The National sample survey (1950-59) showed the same difference in epidemiological pattern.

Second peak of tuberculosis cases was seen in elderly age groups i.e. after 50 years of age in this study. Vishwanathan (1960) confirmed the fact that more and more patients in higher age groups are admitted these days in T.B. Institution. De Cara (1961) came to the conclusion that there were twice as many patients over 60 years in sanatorium, males predominating $2\frac{1}{2}$ times over females. According to Rich (1951) the

possible factor for tuberculosis in higher age group is lowering of the resistance in that age as compared to the younger age groups. Grosset and others (1929) have also shown that immune mechanisms tend to decline in efficiency in the aged as the antibodies are formed much less readily in old age than in young persons. The deleterious effect of tobacco smoking and alcohol on resistance to tuberculosis applies mainly to older males.

In our study the pulmonary tuberculosis mainly affected lower socio-economic groups and labourers. Anderson et al (1954) also found the prevalence of disease significantly more in the lowest economic group. Association of tuberculosis with poverty has been attracting attention since long. Poverty implies low standard of living, a certain amount of malnutrition specially protein deficient diet, over crowding and unhygienic living conditions. A survey in a large group of civil servants in Delhi (Pamra and Mathur, 1968) showed prevalence and incidence of tuberculosis to be nearly three times more in low income group than in middle income group. Some of the occupations are better paid and the consequent better economic status reduces the susceptibility to disease of those working in them as compared to others like unskilled labourers whose wages are poor and work very exhausting. Differences in the

susceptibility of persons engaged in various occupations seen in this study may only be due to the difference in the standard of living of the persons concerned.

About one third of cases were having positive family history of tuberculosis in this study. Similar instances of high infectiousness has been reported by Medler (1956). The question of inheritance of resistance or susceptibility to tuberculosis has not yet been precisely answered. Family history of tuberculosis is mainly concerned with the history of contact. Heaf and Rusby (1957) stated that the source need not always be familial, more often it is extrafamilial and therefore difficult to locate.

Symptomatology of the patients under study is similar to the reports of Jaswant Singh (1975). In our cases cough was a feature of almost 100% cases. Jaswant Singh found it in 96% cases. Fever was present in 62.5% cases, in our study whereas it was present in 86% of his cases. Weakness, loss of weight, chest pain and loss of appetite were seen in 70-80% cases of our study group. These findings are similar to the study conducted over 5000 patients at the Medical College of Patiala and Amritsar (Jaswant Singh, 1975). Hemoptysis was seen in 30% cases of our study which is similar to findings of Pamra et al (1970) and Jaswant Singh (1975). Symptoms of pulmonary tuberculosis do not form a clear cut

syndrome. Appearance of symptoms, early or late depends not only upon the extent and situation of the lesion but primarily upon the state of natural resistance, allergic hypersensitivity and the virulence of the infective organism. More over symptoms may persist even after the lesion is healed, as in residual bronchiectasis, fibrosis, chronic bronchitis and secondary infections. Lassitude is one of the earliest symptoms. In the beginning it is experienced only towards the end of the day and disappears after a short rest. Gradually the patient begins to feel tired earlier and more easily. Loss of weight slow but progressive, is frequent. It may be due to digestive disorders but may occur even otherwise.

As a rule, every case of active pulmonary tuberculosis, exhibits some degree of pyrexia which is one of the important clinical criteria of activity. In the early phases the fever is slight and of short duration, usually occurring in the late after noon or evening. Of all the symptoms of pulmonary tuberculosis cough is the most common and gets exaggerated when respiratory infection is co-existing. Sputum is usually scanty and mucoid or mucopurulent. Hemoptysis is very important diagnostic evidence in pulmonary tuberculosis. Pamra et al (1970) found more than half of their patients with a history of hemoptysis. Pain in the chest is a not a permanent feature of pulmonary tuberculosis. Acute pain

in the chest is due to dry pleurisy. It is worst at the height of inspiration. Digestive disturbances are some times prominent. They are characteristically vague and of the nature of dyspepsia, such as fullness after meals, flatulence, anorexia and occasional heart burn.

In our study one quarter of patients were having duration of illness ranging from 2-3 years and nearly half were having duration of illness ranging from 3-5 years. In series conducted by Agarwal et al (1983) more than two third of cases were having duration of illness beyond 5 years.

In our study 75% patients were taking irregular treatment. This included both inadequate dosage of the drugs and insufficient duration of treatment. Various reasons which we observed for irregular treatment were poverty, interference by occult or quack medicine in the scientific practice of chemotherapy of tuberculosis. Interference of other indigenous system of medicine and failure on the part of the patient in his allegiance to the doctors instruction particularly in the regularity of drug taking and in continuation of the treatment for the prescribed period. These shortcomings on the part of the patients arises, in most cases, soon after the symptoms of cough and fever disappears. Gangadharan (1968) also reported same extent of the irregular treatment and factors responsible for treatment failure in

tubercular patients. In our study diabetes was diagnosed in 10% cases of pulmonary tuberculosis. The seriousness of the combination has been stressed by many workers. Nanda and Tripathi (1968) found 24 diabetics among 200 patients suffering from pulmonary tuberculosis. Deshmukh et al (1966) found diabetes to the extent of 14%. Lahiri and Sen (1974) found 8% of males and 5% of females of pulmonary tuberculosis suffered from diabetes.

Acid fast bacilli were positive in 83.33% cases of our study. In the study conducted by Agarwal et al (1983) all cases were A.F.B. positive. In our study minimal lesion in X-ray was seen in 30 cases and moderately advanced lesion in 10 cases. Maximum number of cases (80) were having far advanced tuberculosis. These were the cases who had multizonal involvement of lungs with a duration of more than 3 years. They also gave a history of extensive antitubercular chemotherapy which they had prior to their hospitalization to college. Out of these 80 cases 60 were having chronic bronchitis. In the series conducted by Agarwal et al (1983) 48 cases were of minimal tuberculosis, 48 cases were of extensive tuberculosis without bronchitis and 46 cases were of extensive tuberculosis with chronic bronchitis.

In bacterial examination of the sputum difficulties arise because of irregular distribution of organisms (Allison et al., 1943). To overcome this, simple method of homogenization of sputum samples by

adding sterile glass beads in the container and shaking it for 5-10 minutes is described (Elmes, 1953). In the present work homogenization was achieved by same method.

Sputum may be contaminated by bacteria from oral cavity. To remove these oropharyngeal contaminants, the method of washing sputum with sterile saline, three times is described. In the present study also, collected samples were washed with sterile saline three times to eliminate oropharyngeal contaminants. The study is limited to the isolation in sputum of pyogenic organisms only; no attempt was made to culture anaerobes, fungi, mycoplasma etc. No special procedures to obtain uncontaminated secretions from lower respiratory tract have been used such as transtracheal aspiration or fiberoptic bronchoscopy.

In spite of these limitations it was possible to establish the etiological diagnosis with a fair degree of certainty in 50% cases with secondary bacterial infections. This high incidence of success in establishing the etiological diagnosis of secondary infections in sputum appeared to be related to the following factors:

1. Most of these infections occurred in non compromised hosts in whom the isolation of organisms was particularly not difficult (Except few diabetic and few alcoholic cases).
2. Fewer number of patients in the geriatric age

Group who find it difficult to expectorate adequate samples of sputum.

3. Prompt handling of the specimens.

The findings of the present study emphasize that sputum is still an adequate material to isolate pathogens in a large majority of patients with secondary infections.

Brumfitt and Willoughby (1958) have suggested that it may be useful to culture throat swabs as well as sputum, on the ground that if an organism is recovered from sputum but not from throat swab, it may be assumed that its source is in lower respiratory tract, though not if it is recovered from both sputum and throat swabs. In our study out of 93 culture positive sputum specimens 47 (50.54%) were having same pathogens in throat swabs. Forty six (49.46%) sputum specimens were having pathogens exclusively in sputum but not in throat swab.

In the present study, the microorganisms could be grown from 77.5% specimens of sputum. Nearly similar results have been shown by other workers (Agarwal et al, 1983 and Baldev Raj, 1985). The present study showed predominantly *Klebsiella* (44.17%), *Staphylococcus aureus* (15.83%), *Pneumococcus* (9.17%) and *Streptococcus Hemolyticus* (8.33%).

These findings are similar to Agarwal et al (1983). Other Indian workers viz. Tankhiwala et al (1984)

demonstrated growth of *Klebsiella* in 44.13% cases and coagulase positive *Staphylococcus* in 21.90% cases.

Pradhan et al (1979-) demonstrated *Klebsiella* in 44.44% cases.

In the series conducted by Sharma et al (1981) out of 13 cases with pulmonary tuberculosis potential pathogens were grown in 5(38.4%) in lower respiratory tract secretions (*Pseudomonas* in 2, *Klebsiella* in 1, *E.Coli* in 1 and *Streptococcus Hemolyticus* in 1). Using rigid bronchoscopy, Benstead (1950) found potential pathogens in 58% cases and Lees and Mc Naught (1959) in 13% cases of uncomplicated pulmonary tuberculosis and in 75% cases of pulmonary tuberculosis with significant bronchitis. Potential pathogens in their series were *Hemophilus influenzae*, *Pneumococcus*, *Streptococcus* and coliforms. If we compare the findings of our study with those having bronchitis and those without bronchitis results are similar to Agarwal et al (1959). In our study of group A cases with minimal lesion tuberculosis potential pathogens in the sputum were grown from 22 (77.33%) out of 30 patients. *Klebsiella* was grown from nearly 12 (50%) cases. *Staphylo. aureus* from 4 and *Pneumococcus* from 2 specimens. Findings are in close corroboration with Agarwal et al (1983). In group B those with moderate to extensive tuberculosis, the yield of potential pathogens in the sputum was seen in 24(80%).

Out of 30 cases again Klebsiella and Staphylococcus, Streptococcus, Hemolyticus and Pneumococcus were predominant pathogens seen in 11, 5, 4 and 3 cases respectively. In group C, those with chronic bronchitis the yield of potential pathogens was high as much as in 57 (95%) out of 60 cases. Klebsiella was again seen in highest number (30 cases) followed by Staphylococcus aureus (10 cases), Pneumococcus (6 cases) and Streptococcus hemolyticus (4 cases). In this group Pseudomonas, Proteus, Hemophilus influenzae and E. coli were also seen which were absent in corresponding throat swabs. High yield of potential pathogens in patients with pulmonary tuberculosis with chronic bronchitis suggested that probably these organisms are cause of chronic bronchitis in these cases.

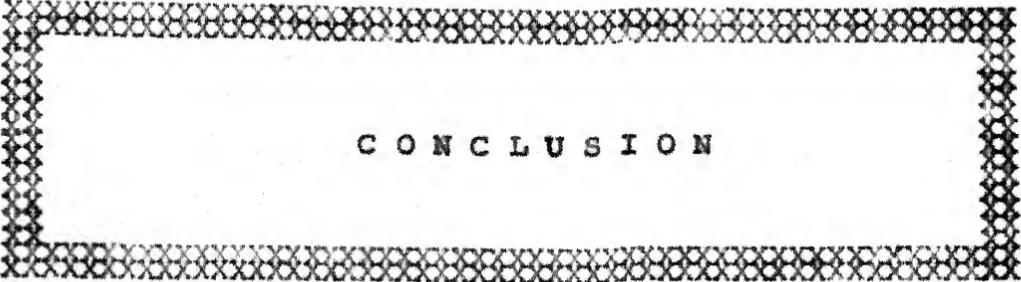
Previous workers (Mulder, 1938; Elmes et al, 1953) have reported Pneumococcal and Hemophilus influenzae as the commonest pathogens responsible for secondary infections in pulmonary tuberculosis in all three groups of cases. They have further suggested that these pathogens play an important role in development of chronic bronchitis arising as sequel to pulmonary tuberculosis.

It is generally believed that during sleep, when the larynx is off guard and in the course of upper respiratory tract infection, the material from the upper respiratory passages gravitates in the bronchial

tree. When the bronchial tree is healthy it is usually able to rid it self of this infected material but if it is extensively damaged as a result of pulmonary tuberculosis, potential pathogens from upper respiratory tract may well be able to secure a permanent foothold in the lower respiratory tract. This explains why there has been a high yield of potential pathogens from sputum in group C cases. Reid (1958) considered that in chronic bronchitis as a sequel of pulmonary tuberculosis potential pathogens are mostly found in lower respiratory tract due to their constant trickling from upper respiratory tract. An increasing breathlessness and extensive expectoration in chronic cases of pulmonary tuberculosis has previously been thought to be due to the constant presence of tubercle bacilli. But from present study, it has become clear that presence of potential pathogens in such cases is the real cause of constant dyspnoea and sputum production. A number of antituberculosis drugs like Streptomycin and Rifampicin are active against variety of organisms. For example, Streptomycin is effective against E.coli and Klebsiella Pneumonial. Seimilarly Rifampicin is active against Meningococcus, Staphylococcus aureus, Pneumococcus and Hemolytic streptococci. It appears that resistance soon develops in these organisms against these anti-tubercular drugs in course of the treatment.

In the management of pulmonary tuberculosis therefore, seems best to dispense with routine bacteriology as a guide to start therapy and to select an antibiotic effective against important potential pathogens isolated from such cases before or during antitubercular chemotherapy.

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C O N C L U S I O N

CONCLUSION

The present work was carried out with the aim to study the prevalence and clinical impact of secondary bacterial infections in pulmonary tuberculosis. The attempt was made to know the non tubercular bacterial flora of upper respiratory passage and compare with these detected in sputum culture. For this purpose 120 patients of pulmonary tuberculosis were selected from the wards of department of medicine and tuberculosis and chest diseases. All these cases were subjected to detailed assessment encompassing a thorough history taking, clinical examination, sputum examination for A.F.B., other laboratory investigations and X-ray chest P.A. view. From each case upper respiratory secretions (throat swab) and sputum were collected and subjected for gram's staining and culture. Final identification of pathogens was done by their colony characteristics and standard biochemical tests. To overcome the problem of contamination of sputum from oropharyngeal flora, we adopted two methods. Firstly sputum was washed 3 times with normal saline and then mucopurulent part of the sputum was cultured. Secondly if throat swab and sputum showed same organisms we labelled them contamination, and if sputum showed pathogens but not the throat swab we accepted as representative of lower respiratory tract

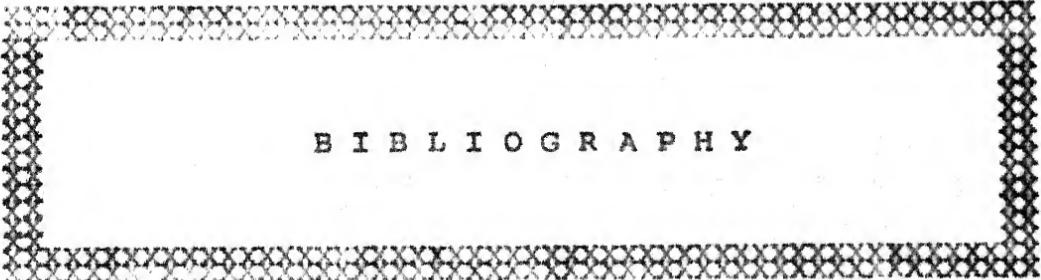
infection. The observations mainly related to collective clinical profile and identification of aerobic bacteria from respiratory tract. No attempt was made to isolate anaerobes. The findings of study can be summarised as follows :-

1. Case material consisted of nearly 75% males and 25% females.
2. More than $\frac{1}{3}$ rd of the male patients fell in the age group 41-50 years. In the females $\frac{2}{3}$ rd of the patients fell in the 21-30 years of age group.
3. Pulmonary tubercular patients tended to come from lower socio-economic status and rural areas of Bundelkhand. Tuberculosis was much more prevalent in labourers.
4. Family history of pulmonary tuberculosis was present in one quarter of cases but most of the time source of the infection was extra familial and difficult to locate.
5. Sizeable number of patients in our study were smokers and habitual of tobacco chewing.
6. Cough with expectoration, fever, loss of weight, anorexia, chest pain, breathlessness and hemoptysis were the common presenting symptoms in pulmonary tuberculosis with secondary bacterial infections in our study.

7. In the present study, the micro-organisms could be grown from 93 (77.5%) specimens of sputum.
8. Out of these nearly 50% patients were having same pathogens in the sputum and the throat swab. In rest 50% cases though the organisms were present in sputum but not in throat swab.
9. Thus study emphasized that "sputum culture is still an adequate material to isolate pathogens".
10. It was possible to establish the etiological diagnosis with a fair degree of certainty in 50% cases with secondary bacterial infections.
11. The present study showed predominantly Klebsiella in 44.17% cases followed by Staphylococcus aureus in 16.83% cases, Pneumococcus in 9.17% cases and Streptococcus hemolyticus in 8.33% cases.
12. Rarity with which Hemophilus influenzae recovered from sputum specimen was a significant finding of this study. This finding is in contrast to western workers who have reported Hemophilus influenzae as the predominant pathogen.
13. The magnitude of the problem of secondary bacterial infections was least with minimal lesion. It was more in those having moderate to far advance tuberculosis and those having superimposed chronic bronchitis.

14. High yield of potential pathogens from cases with extensive tuberculosis with chronic bronchitis suggested that these organisms were responsible for the development of chronic bronchitis, extensive expectoration, increasing breathlessness and hemoptysis seen in these cases.
15. It could be concluded that in the management of pulmonary tuberculosis one must dispense with routine bacteriology as a guide to therapy and to select suitable antibiotic against specific pathogens.

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B I B L I O G R A P H Y

B I B L I O G R A P H Y

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A P P E N D I X

SECONDARY BACTERIAL INFECTIONS IN PULMONARY TUBERCULOSIS

M.R.D. No.

Date :

1. Name
2. Age Sex:
- 3 Address:
4. Marrital status Married/Single
5. Occupation : House wife/labourer/office worker/
student
6. Socio-economic status : Class
7. Rural / Urban
8. Religion : Hindu/Muslim/Christian.
9. Duration of illness : months years
10. Family History : Tuberculosis : Present/Absent
11. Personal History : Diabetes : Present/Absent
: Hypertension : Present/Absent
12. Past Illness : Pleuresy/Pneumonia/Prolong fever
13. History of Antitubercular : Fresh/Treated/
drugs taken Resistant case.

SYMPTOMS

1. Cough : Dry/Paroxysmal/Continuous/Postural/
Morning/Evening/Any time
2. Sputum : oz.
: Yellow/white/Mucoid/No smell/
Foul smell/Watery.
3. Breathlessness : Grade

- 02
4. Fever : Continuous/Intermittent
: With or without chills & Rigors
: Duration
 5. Hemoptysis : Daily/Weekly/Monthly/Yearly
: Amount of blood
 6. Pain in abdomen : Present / Absent
 7. Pain in Chest : Present / Absent
 8. Bowels : Regular/Constipated, Diarrhoea.
 9. Weight loss : Present / Absent
 10. Swelling : Face, feet, abdomen, generalised.
 11. Any other :

EXAMINATION

GENERAL

- Look : Looking ill/Healthy
- Built : Thin/Average/Obese
- P.R. :
- B.P. :
- R.R. :
- Clubbing : Grade : H.P.O.
- Edema : Face, feet, abdomen, generalized.
- Lymphadenopathy, Ceriseal, Auxillary.
- Cyanosis : Absent / Peripheral / Central
- Jaundice : Present / Absent

RESPIRATORY SYSTEM

INSPECTION

1. Type of respiration : Abdominal, thoracic, abdominothoracic
2. Shape of Chest : Symmetrical / Asymmetrical

PALPATION

- Trachea : Central / Right / Left
- Expansion of Chest
- Position of apex beat Cem. From M & L in ICS
- Vocal fermitus : Normal / Increased / Decreased
- Intercostal spaces : Normal / Narrow / Wider

PERCUSSION

Normal resonant, Hyperresonant, Impaired, Dull, Stony Dull.

AUSCULTATION

Breath Sounds : Bronchial / Vasicular

Accompaniments : Crepts, Bronchi, friction rub
suction spasm

ABDOMEN

Space	Scaphoid, Depressed, Protuberant Movements, Symmetrical, Asymmetrical
Liver	Present/Absent
Spleen	Present/Absent
Other lumps	Present/Absent
Tenderness	Present/Absent
Fluid	Present/Absent

C.N.S.EXTERNAL GENITALIASKIN

C.V.S.

P.R.

B.P.

J.V.P.

Raised / Not raised

Heart sounds

Both audible

Accompaniment

Present / Absent

INVESTIGATIONS

1. T.L.C.

/cu mm

D.L.C. : P %, L %, E %, M %

Hb gm%

E.S.R. for first hour

2. X-ray Chest

3. Sputum :

(a) Gram's staining

(b) A.F.B.

(c) Culture

4. Throat Swab

(a) Gram's staining

(b) Culture

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